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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,905	02/27/2004	Yi-Sun Chung	29925/39910	8922

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EXAMINER

MAI, ANH D

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 02/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/789,905

Applicant(s)

CHUNG, YI-SUN

Examiner

Anh D. Mai

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2-6 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-6 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 2/27/2004.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: “120” (Fig. 3c). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### *Specification*

2. The disclosure is objected to because of the following informalities:

Page 9, lines 14-17, discloses: “...growing a transistor gate oxide film 50 in the regions when the varactor oxide film 110 was not formed. At this time, as the gate oxide film 50, a dielectric material such as SiO<sub>2</sub>, SiON and the like is deposited.”

How exactly the gate oxide film 50 is formed, grown or deposited ?

Appropriate correction is required.

*Claim Objections*

3. Claim 1 is objected to because of the following informalities:

Lines 7-8 recites: patterning the resultant material and etching the first polysilicon and the gate oxide film to form a transistor gate.

In this context, patterning and etching is the same.

Line 12, recites: depositing the second polysilicon... The correct term should be: a second polysilicon.

Appropriate correction is required.

*Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, lines 12-13 recites: depositing the second polysilicon and then patterning the same to form a varactor gate.

Similarly, claim 2, lines 7-8, recites: removing the regions except for the varactor to pattern the same.

What is “the same” referring to ?

Claim 1, lines 14-15, recites: removing the photoresist film of the transistor forming region and then proceeding to the following process.

What is “the following process” ?

The same also applies to claim 2.

Claim 2, lines 10-11, recites: “... implanting ions in accordance with an MOS type...”.

Since there are so many ways to implant ions in the formation of a MOS type, it is not known which ions implantation the claim tries to encompass.

5. The claims are generally narrative and indefinite, failing to conform with current U.S. practice. They appear to be a literal translation into English from a foreign document and are replete with grammatical and idiomatic errors.

Claim 1, lines 5-6, recites: depositing a gate oxide film and a first polysilicon after the formation of the device isolation film.

There is no structure relation between the gate oxide, the first polysilicon and the device isolation and the substrate. Overall, there is no nexus between the “steps”.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –  
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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6. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Applicant Admitted Prior art (hereinafter AAPA).

With respect to claim 1, as best understood by the examiner, AAPA teaches a method for manufacturing a MOS varactor as claimed including:

forming a device isolation film (40) on a semiconductor substrate (10);

depositing a gate oxide film (50) and a first polysilicon (60) after the formation of the device isolation film (40);

patterning the resultant material and etching the first 10 polysilicon (60) and the gate oxide film (50) to form a transistor gate (TG);

coating the entire resultant material with a photoresist film (not shown), then opening a varactor forming region and then forming a varactor oxide film (50) of a high dielectric material;

depositing a second polysilicon (60) and then patterning the same to form a varactor gate (VG); and

removing the photoresist film (not shown) of the transistor forming region and then proceeding to the following process.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA as applied to claim 1 above, and further in view of Braithwaite '498.

AAPA is shown to teach all the features of the claim as described in claim 1 above, with the exception of using an oxide selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ta}_2\text{O}_5$ ,  $\text{HfO}_2$ ,  $\text{ZrO}_2$ ,  $\text{HfON}$ ,  $\text{BST}$  and  $\text{TiO}_2$ .

However, Braithwaite teaches that  $\text{SiO}_2$  or any other material with a dielectric constant greater than that of  $\text{SiO}_2$  such as  $\text{HfO}_2$  can be used for the varactor oxide film 114.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the varactor oxide of AAPA utilizing  $\text{HfO}_2$  as taught by Braithwaite because the dielectric constant of  $\text{HfO}_2$  is much larger than that of  $\text{SiO}_2$ , thus improve capacitor having higher capacitance ratio is achieved.

8. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA as applied to claim 1 above, and further in view of Braithwaite '498 and Metzner et al. (U.S. Pub. No. 2003/0232506).

AAPA is shown to teach all the features of the claim as described in claim 1 above, with the exception of using an oxide selected from the group consisting of  $\text{Al}_2\text{O}_3$ ,  $\text{Ta}_2\text{O}_5$ ,  $\text{HfO}_2$ ,  $\text{ZrO}_2$ ,  $\text{HfON}$ ,  $\text{BST}$  and  $\text{TiO}_2$ .

However, Braithwaite teaches that  $\text{SiO}_2$  or any other material with a dielectric constant greater than that of  $\text{SiO}_2$  such as  $\text{HfO}_2$  can be used for the varactor oxide film 114.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the varactor oxide of AAPA utilizing  $\text{HfO}_2$  as taught by Braithwaite because

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the dielectric constant of  $\text{HfO}_2$  is much larger than that of  $\text{SiO}_2$ , thus improve capacitor having higher capacitance ratio is achieved.

Further, Metzner teaches  $\text{HfO}_2$  can be formed on a substrate utilizing MOCVD, ALD, etc., at a temperature (of about 225 °C to about 700 °C) that includes the claimed range (less than 400 °C).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form  $\text{HfO}_2$  of Braithwaite utilizing the method and deposition temperature as taught by Metzner to form the varactor oxide on the substrate.

9. Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Braithwaite et al. (U.S. Pub No. 2003/0102498) in view of Chau et al. (U.S. Patent No. 6,087,236).

With respect to claim 2, as best understood by the examiner, Braithwaite teaches a method for manufacturing a MOS varactor substantially as claimed including:

forming a device isolation film (106) on a semiconductor substrate (102);

forming a varactor oxide film (114) of a high dielectric material over the entire surface of the resultant material and then removing the regions except for the varactor to pattern the same.  
(See Fig. 1).

Thus, Braithwaite is shown to teach all the features of the claim with the exception of further detailing the subsequence process steps of the CMOS processing method.



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However, Chau teaches process steps for forming different devices in a CMOS including: after removing the oxide film (106) in a region (on the right side of the drawing) except for the other region (on the left side of the drawing) of a MOS structure;

depositing a gate oxide film (112) and a polysilicon (120) on the entire surface of the resultant material and implanting ions in accordance with an MOS type; and

patterning the polysilicon (120) by a mask (not shown), patterning the transistor gate (120b) and the other gate (120a) and then proceeding to the following process. (See Figs. 1-5 and 10-11).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the MOS varactor of Braithwaite in a CMOS process as taught by Chau because the formation of a MOS varactor is well known to be integrated in a conventional CMOS process.

With respect to claim 5, the varactor oxide film (114) of Braithwaite is selected from the group consisting of  $\text{HfO}_2$ .

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Braithwaite and Chau as applied to claim 2 above, and further in view of Metzner '506.

Braithwaite teaches forming a varactor oxide film (114) of high dielectric material over the entire surface of the resultant material.

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Thus, Braithwaite is shown to teach all the features of the claim with the exception of disclosing the deposition technique and the temperature.

However, Metzner teaches  $\text{HfO}_2$  can be formed on a substrate utilizing MOCVD, ALD, etc., at a temperature (of about 225 °C to about 700 °C) that includes the claimed range (less than 400 °C).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form  $\text{HfO}_2$  of Braithwaite utilizing the method and deposition temperature as taught by Metzner to form the varactor oxide on the substrate.

### *Conclusion*

Be advised, there are numerous errors within the claims such as using “the” instead of “a”, also the structure relationship between the steps must be adhered to.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 9:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

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applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Anh D. Mai', with a stylized flourish extending to the right.

Anh D. Mai  
February 15, 2005